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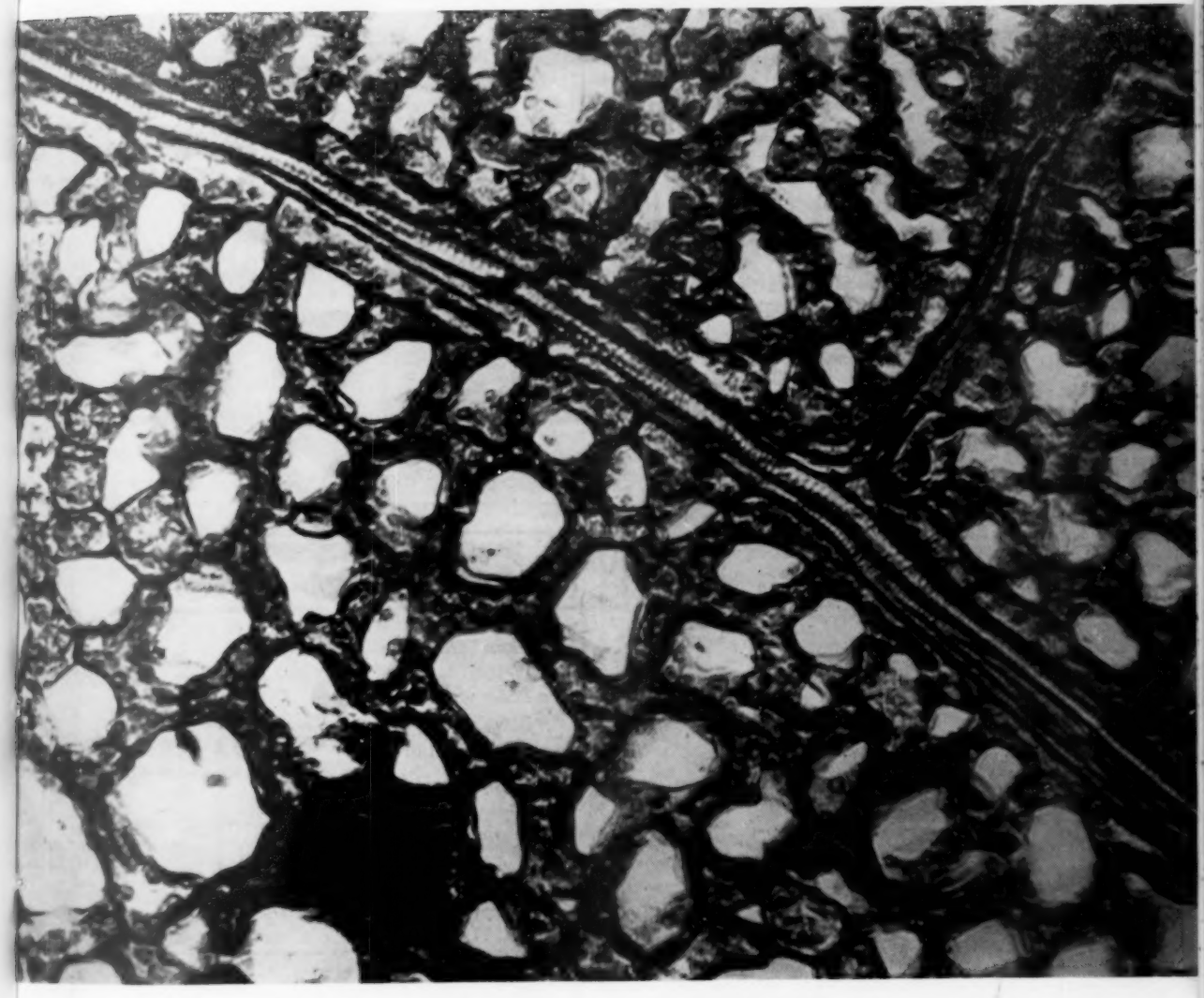

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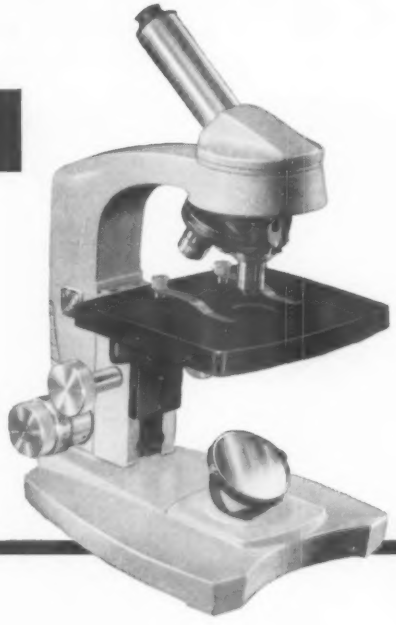

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Cover Photograph

Paradermal section (cut parallel to the epidermal layer) of *Cornus florida* (Dogwood) showing large, spongy mesophyll spaces and cells, minor venation. Photomicrograph by Richard R. Armacost, Purdue University.

THE AMERICAN BIOLOGY TEACHER

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THE JOURNAL

Your present co-editors are now beginning their third year in office. Many changes have been made in your Journal. We want your opinion on these and other matters connected with the Journal.

The caliber of articles we receive is constantly improving. Many members of the National Association of Biology Teachers have helped the co-editors to solicit manuscripts from competent authors in high schools, colleges and universities, industry, and fields related to various phases of biology. We hope this necessary aid will be continued and expanded. Why don't you ask someone in your area to send in an article which would be helpful and interesting to biology teachers? Or better still, write up some of your favorite ideas or techniques and send them to us. Best wishes for a pleasant holiday season.

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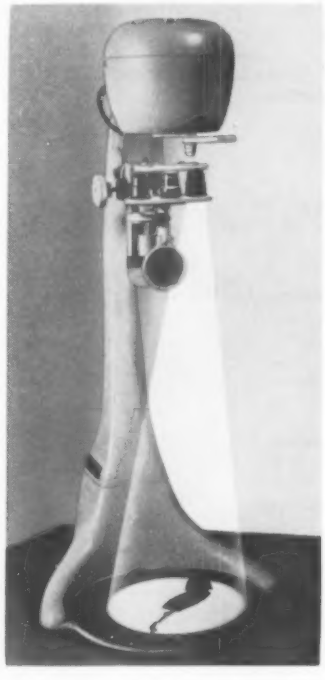

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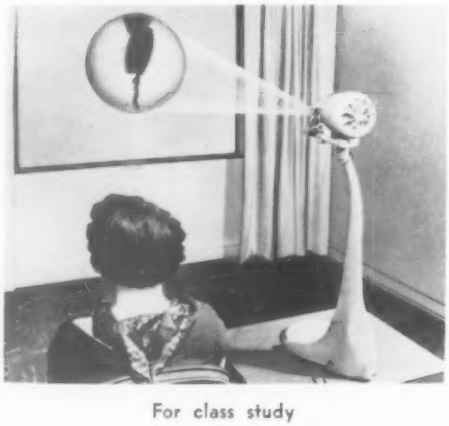

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Biology Projects for High School Students[1]

WILLIAM KASTRINOS
Glenbard Township School
Glen Ellyn, Illinois

The project method of teaching is an ideal way to stimulate scientific thinking in high school students. The work at our school is done entirely by the student on his own time under the guidance of the teacher. Most high school students need help in the selection of a project. As an aid to the student in selecting a project in biology a card file can be set up which will furnish ideas and also suggest available source material. The more worthwhile projects can be selected for competition at the District and State Science Fairs. The card file can be enlarged from year to year.

The following suggested projects may be helpful to those interested in starting a card file of biology projects for high school students.

ANATOMY OF THE EAR—The internal anatomy of the ear can be diagrammed in chart form or a plaster model of the ear can be made. Another interesting study can be made of the ear bones, dissected from different mammals and mounted in plastic.

References:

Best, C. H. and Taylor, N. B., *The Living Body*, Henry Holt and Company, New York, New York.

Xoethout, W. and Tuttle, W. W., *Textbook of Physiology*, C. V. Mosby and Co., St. Louis, Missouri.

ANIMAL HEREDITY—Cross a chocolate mouse with a white mouse, or cross a golden hamster with an albino hamster. Make sure the parents are pure-breds. Carry the experiment through the F_2 generations. More than one cross can be made with the F_1 generation. It is important that you report your findings accurately regardless of the results. Prepare in chart form or by some other means to show your results.

References:

Winchester, A. M., *Genetics*, Houghton Mifflin Company, New York, New York.

Goldstein, Phillip, *Genetics Is Easy*, Lantern Press, New York, New York.

ARTIFICIAL RESPIRATION—A comparison of the Shafer and Back Pressure Arm Lift methods. Equipment: pneumograph, marey tambour, clamps and kymograph.

The pneumograph is placed around the chest of the student and attached to the marey tambour by rubber tubing. The pressure in the apparatus is regulated by the clamps. The tambour's writing point is placed against the kymograph paper. A timing device should be added to the tracing. This can be done with the use of a signal magnet and a student closing an attached key every 15 seconds. Record the results and note the difference in the two methods.

References:

"Use of the Kymograph to Show the Differences in the Shafer and Back Pressure Arm Lift Methods of Artificial Respiration," Science Teacher, October 1954.

Zoethout, William, *A Textbook of Physiology*, C. V. Mosby Co., St. Louis, Missouri.

Harvard Manual, Harvard Apparatus Co., Dover, Mass.

BALANCED FRESH WATER AQUARIUM—Select an aquarium tank. If a commercial tank is not available use half-gallon and gallon jars. The next step is to select a substratum, plants and animals. Be well acquainted with some of the problems that commonly occur in balanced aquaria and be prepared to make the necessary adjustments.

References:

Miller, D., and Blaydes, G., *Methods and Materials for Teaching Biological Sciences*, McGraw Hill Book Co., New York, New York.

Turtox Service Leaflets Nos. 5, 11, 23 and 48, General Biological Supply House, Chicago 20, Illinois.

BIRD NEST PROJECT—The best time of the year for the collection of bird nests is in the fall. Collect nests from a variety of habitats. Look especially for nests of Baltimore Orioles, Red Wing Blackbirds and Goldfinch as these will give you some of the basic differences in nests. The nests can be readily identified with the use of a key.

[1]Developed as part of a summer workshop program held at Purdue University, 1956.

References:

Nest Key, Morton Arboretum Work Sheet, Morton Arboretum, Lisle, Illinois.

BLOOD COUNTING—With the use of the hemocytometer take samples of blood and count the number of red blood cells and white blood cells. Extreme care in the handling of the pipette will make for accurate results. With your results make a comparison with the known norms and give whatever explanation is necessary.

References:

Zoethout, W. and Tuttle, W. W., *Textbook of Physiology*, C. V. Mosby and Co., St. Louis, Missouri.

Zoethout, W., and Tuttle, W. W., *Manual of Physiology*, C. W. Mosby and Co., St. Louis, Missouri.

Carlson, A. and Johnson, V., *The Machinery of the Body*, University of Chicago Press, Chicago, Illinois.

BLOOD TYPING STATION—Test one hundred or more students using the acceptable sterile techniques and compare it with the known blood groups. You can also test for the Rh factor. Make a chart of your results.

References:

Best & Taylor, *The Living Body*, Henry Holt and Company, New York.

Zoethout, W. and Tuttle, W. W. *Textbook of Physiology*, C. V. Mosby and Co., St. Louis, Missouri.

BUDDING AND GRAFTING PROJECT—This project could be done in several ways. You could mount an example of budding, whip grafting and cleft grafting on a wooden frame. You can also start a young apple or orange tree and graft different varieties of apples or lemons on to your starting plant.

References:

Budding and Grafting of Fruit Trees, Extension Bulletin No. 257, 1947, Purdue University, Lafayette, Indiana.

Garner, R. J., *The Grafters Handbook*, Oxford University Press.

COLLECTION AND STUDY OF MOLDS—Make a collection of the different types of mold that occur commonly on foodstuffs. This project could have many variations. Pencillin, its history and processing could be one. Life cycle of bread mold another. Exhibit your collection and turn in a report.

References:

Smith, G., Evans, B., Stauffer, *A Textbook of General Botany*, MacMillan Co., New York, New York.

CYCLE DEMONSTRATOR—Make some type of revolving stand or platform on which cards can be mounted to show the life cycles in plants and animals. This equipment can also be used to show the sequences that take place in living substances. Some suggestions for subject matter would be mitosis, insect metamorphosis, life cycle of rust, fern, mosses, frog development, etc.; make several sets of these.

References:

"The Project Method of Teaching Biology," Luther S. West, American Biology Teacher, Vol. 18, No. 2, February 1956.

Pauli, Wolfgang F., *The World of Life*, Houghton Mifflin Company, Chicago, Illinois.

Hegner, *An Introduction to Zoology*, MacMillan Co., New York, N. Y.

MINERAL DEFICIENCY IN PLANTS—Either by the use of water culture or sand a rather extensive experiment can be set up to show the deficiencies in plants when they lack the proper elements and compounds. You should have a control group and some with a deficiency in calcium, potassium, iron, magnesium, nitrogen and sulphur. This project will take quite a bit of reading to do a satisfactory job. Become well acquainted with the deficiencies to be expected and the approximate time it will take these deficiencies to develop before you start.

References:

Turner, Wayne, and Henry, *Growing Plants in Nutrient Solutions*, John Wiley and Sons.

EDIBLE AND POISONOUS MUSHROOMS—Mushrooms are most abundant after rainy weather in July, August, and September. Be careful to pick the entire mushroom. If you break the stem you are liable to have difficulty in identifying the specimen. Try to get several mushrooms from the same group in various stages of development. Use small paper bags to keep each group of specimens separate. Turn in a report and an exhibit.

References:

Thomas, William, Field Book of Common Mushrooms, G. P. Putnam Sons, New York, New York.

Bastin, Harold, *Plants Without Flowers*, Philosophical Library, New York, New York.

EMBEDDING SPECIMENS IN TRANSPARENT PLASTIC—In this type of project, skeletons of small animals can be embedded to show comparisons. Be sure you are well acquainted with the procedures in embedding before you begin. Earbones of several animals can be embedded. There are many other possibilities of materials to embed. In this way, your specimen can be passed around without any harm coming to it.

Reference:

Turtox Service Leaflet No. 33.

THE EMBRYONIC DEVELOPMENT OF A CHICKEN—Acquaint yourself thoroughly with the method and techniques involved before you begin. In-

cubate, mount and fix the chick embryos every 24 hours until the chicks hatch. Make observations as to the development stage of the different organs when each egg is opened.

References:

Turtox Service Leaflet No. 17.

Shumway, Waldo and Adamstone, F. B., *Introduction to Vertebrate Embryology*, John Wiley and Sons, New York, New York.

EVERGREEN PROJECT—In this project you can show the different types of evergreens and how they can easily be identified. Make a collection of the different types and mount them on cardboard, showing the various characteristics of each. It can be shown how pines are different from spruce and fir, also fir from spruce. Collections sufficient for you to demonstrate for the class or group can be easily collected.

References:

"A Key to the Evergreens of Indiana," Agricultural Extension Service, Purdue University, Mimeo F-12, Lafayette, Indiana.

"Evergreens Forever," W. Laurence Palmer, Nature Magazine An Educational Insert, 1214 16th St., N. W., Washington 6, D. C.

"The Evergreen Trees," The Bulletin of Popular Information, Volume 20, 1945, Nos. 6 and 7, Morton Arboretum, Lisle, Illinois.

FOOD PROCESSING—Demonstrations can be set up to show the benefit of freezing and pasteurizing foodstuffs. The visible results of pasteurizing food will be readily seen when you prepare a vegetable such as tomatoes, putting one can up "as is" and pasteurizing the other. You can also demonstrate the benefit of balancing foods before freezing by blanching one and not the other. Add hydrogen peroxide to each of the samples and decomposition due to enzyme action can be seen in one and not the other.

References:

Canned Food Reference Manual, American Can Company, 11th Ave. and St. Charles Road, Maywood, Illinois.

Composition of Food, U. S. Department of Agriculture, Agriculture Handbook No. 8, Washington, D. C.

HEMOGLOBIN—Acquaint yourself with the type of hemometer you will use in your experiment. After you are familiar with its use and the use of the color chart, you may begin testing. You should use only the best sterile techniques in obtaining the drop of blood necessary to give you a reading on your color chart. Test a large number of subjects and chart your results.

References:

Best, C. Y. and Taylor, N. B., *The Living Body*, Henry Holt and Company, New York, New York.

Zoethout, W. and Tuttle, W. W., *Textbook of Physiology*, C. V. Mosby and Co., St. Louis, Missouri.

HEREDITY PROJECT—Drosophila Experiment: In this project select flies that show dominant and recessive characteristics. Cross a male with a virgin female and trace their offspring through the F_2 generation. Tabulate your results accurately and explain the results.

References:

"Drosophila Experiments for High School Biology," Allen B. Burdick. *The American Biology Teacher*, Vol. 17, No. 5, May, 1955. Turtox Service Leaflet No. 15.

"Suggestions for Laboratories in College Courses in Genetics," Taylor Hinton. Vol. 25, Nos. 1 and 2, Jan. and Feb. 1947, Turtox News. (Reprints available from Turtox).

HYDROPONICS PROJECT—This project demonstrates soil-less plant growth. Seeds may be germinated in vermiculite and transplanted when their root system is fairly well developed. Some of the elements can be removed, such as boron to demonstrate its effect on growth and development of the plant.

References:

Turtox Service Leaflet No. 51.

"Science News Letter," Vol. 33, No. 23, Page 362, Science Service, Washington 6, D. C.

Ellis and Swaney, *Soilless Growth of Plants*, Reinhold Publishing Corporation, New York, New York.

"You Can Try It Yourself," F. J. Taylor, Saturday Evening Post, August 20, 1938, P. 14.

Nutriculture, Purdue University Agricultural Experimental Station, S.C. 328, 1948.

IDENTIFICATION OF BIRDS—This project should be started in the Spring. The common birds of your own area should be known before any work is done in the field. There are many types of projects in Ornithology. On the basis of study and field work, you can separate the migrants from the resident birds; or you can connect each bird with a type of habitat or the types of food eaten, or the manner in capturing food.

References:

Turtox Service Leaflet No. 29.

Peterson, Roger Tory, *A Field Guide to the Birds*, Houghton Mifflin Co., Boston, Mass.

LANTERN SLIDES—Lantern slides can be made to illustrate a large number of biological principles. You can show the stages in mitosis, metamorphosis, butterfly wings, leaves or thin wood sections can be mounted. There are many possibilities that you can think of that will be interesting and fun to prepare.

Reference:

Turtox Service Leaflet No. 45.

LEAF COLLECTION—Your collection can be made in the early Spring or in the Fall. With the

use of the keys and available literature each leaf should be classified and described. For instance, you should have an example of a compound leaf and a simple leaf, one branch that has opposite branching and another with alternate. Leaf prints can be made if you want to add variation to your project.

References:

Watts, M. T., Tree Finder, Nature Study Guild, Naperville, Illinois.

Deam, Charles, C., Trees of Indiana, Indiana Department of Conservation, Indianapolis, Indiana.

Gaudette, Marie E., Things to Do in Nature, Audubon Nature Bulletin, Series No. 15, Bulletin No. 8, Reprinted June, 1948, 1000 Fifth Avenue, New York 28, N. Y.

OWL PELLETS—There are certain areas in Morton Arboretum that owls frequent. Look for some owl pellets under their perching place. These pellets consist of material that the owl cannot digest and is regurgitated in a compact mass. These pellets can be x-rayed and/or carefully pried apart and the skeletal system laid out flat in the proper position. Then, try to identify the animal. Note the resemblance of the small animal's bones to those of the human.

References:

"Owl Pellets X-rayed," Welch Biology and General Science Digest, Vol. 2, No. 2, February, 1953 W. M. Welch Scientific Co., 1515 Sedgwick St., Chicago 10, Illinois.

"Owl Pellets X-rayed," Peter Ghent, Nature Magazine, Nov. 1952.

PHOTOPERIODISM—Take one group of plants that are "long day" plants, such as radishes, lettuce and beets and one group of "short day" plants, such as violets, chrysanthemums and asters. Subject some of them to varying amounts of light. For instance, you can expose the short day plants to a long period of light (artificial) and the long day group to a short period. Compare and discuss your results.

References:

Miller, Erston V., *Within the Living Plant*, Blakeston Company, Inc., New York, New York.

"Day Length and Flowering," Borthwick, H. A., U. S. Department of Agriculture Yearbook, Separate No. 1920: 273-283, Govertment Printing Office, Washington 25, D. C., 1943-47.

PLANT HEREDITY—In plant heredity it is advisable to start with a hybrid. Seed can be obtained that carries the recessiveness for albinism. Corn seed and sunflower seed are two of those that carry this recessiveness. Albinism is a lethal factor due to the fact that it does not contain chlorophyll. Prepare in chart form or some other means to report your results. You can take this project a step further by crossing the plants, obtaining the seed and trying to determine which of them still contains the recessiveness for albinism.

References:

Winchester, *Genetics*, Houghton Mifflin Company, New York, New York.

Goldstein Phillip, *Genetics Is Easy*, Lantern Press, New York, New York.

RATS INTELLIGENCE STUDY—Use two or three rats for this experiment. A rat intelligence study can be set up with a maze arrangement or with a testing device which has three turns with only one turn being the right one. Food can be used as a reward for the proper turn and/or a slight electrical shock for the wrong turn. Test every day and carefully record the results.

Reference:

Griffith, John, *The Rat in Laboratory Investigation*, J. B. Lippincott Co., Philadelphia.

REACTION TIME PROJECT—A reaction time experiment to light or sight, sound and touch can be set up with the kymograph equipment. This test should be administered to at least one hundred students, charted and compared with the known norms. An attempt should be made to keep the testing situation consistent.

Wiring set up:

Instructions:

Sight—the subject has his key closed and is told to watch the writing point on the signal magnet. As the tester closes the key the pointer will move. The subject should then release his key.

Sound—the subject reacts to sound of the tester closing the key.

Touch—the subject holds the two bare wires between his fingers.

Note: For sight a small electric light can be wired into the electrical apparatus.

References:

Harvard Manual, Harvard Apparatus Company, Dover, Mass.

Zoethout, William, *A Textbook of Physiology*, C. V. Mosby and Co., St. Louis, Missouri.

THE METAMORPHOSIS OF AN INSECT—For this project you should select several groups of insects. Make sure that you select some animals that show incomplete metamorphosis, such as the grasshopper and praying mantids. Select, also, some that show complete metamorphosis such as the moth and beetles. Preserve some of the specimens to show each stage in their development.

References:

Turtox Service Leaflet No. 34.

Buchshaum, Ralph, *Animals Without Backbones*, University of Chicago, Chicago, Illinois.

(Continued on page 264)

Evaluation of Consultation Service For High School Teachers

WILLIAM A. URICCHIO, SISTER M. MAURICE WHALEN, R.S.M., NANCY MOHN
Mount Mercy College, Pittsburgh, Pennsylvania

A consultation service was designed by the Biology Department of Mount Mercy College to make its facilities available to the high school science teachers within the Pittsburgh area. Because of the great demands placed on biology teachers, it was felt that a service of this type would be beneficial to both students and teachers. It is the purpose of this paper to give a description of, and to relate the problems arising from, this program.

The purpose of the establishment of this program was to attempt to promote closer relations between college and secondary schools in the field of biological sciences. It was hoped that it would provide greater opportunity for an exchange of ideas and methods between teachers at both levels. In addition, we felt the high school teacher could gain better insight into what is expected of the prospective college student. Another reason for the development of this service was to alleviate some of the pressure placed upon the secondary teacher. Because of the increase in student enrollment, the shortage of high school teachers, and heavier teaching duties, instructors are unable to spend as much time as desired on references and examination of new ideas for the classroom.

We also hoped that a program of this type would help some of the newer teachers in organizing their teaching so that students' interest would be motivated by participation in many of the activities which in the past have been considered the duties solely of the teacher. Projects, such as maintaining cultures of protozoa, keeping the aquarium balanced, and arranging terraria can be handled easily by ambitious students thus giving the teacher more time for other interests. Besides promoting better relations, alleviating the pressure on teachers, and helping new teachers, this service had an additional purpose: that of improving the teacher training program in our own college. There is no better way to inform student teachers of the problems they will encounter in teaching than by introducing them to the problems which present day teachers are facing.

At the present time our services include loan collections, library facilities, opportunities for conferences on teaching methods, and a speaker's bureau. The loan collection was organized to introduce teachers to some of the newer materials available and to offer material which they do not have. Our loan collection contains a nearly complete series of invertebrates including some representative life cycles, fully labeled with the scientific and common names. In addition to the invertebrates, there is also a limited supply of the smaller vertebrates. The slide collection which makes up another branch of the loan department contains a large number of microscopic invertebrates, particularly parasites, and cross sections of some of the microscopic forms such as Ascaris, earthworm, hydra, etc. A large number of bacterial cultures are maintained and can be made available within twenty-four hours. Many of the bacterial forms are large enough to be observed with the high power objective. A series of prepared slides showing many of the common pathogenic bacteria is also part of the loan collection.

Available in our botanical loan collection are preserved and living plants. Among the former are demonstration jars of the more common specimens representative of each phylum or division, and a wide variety of plants arranged on herbarium sheets. Living plants, cuttings, and young growths or seedlings are donated outright.

A collection of flower pictures arranged in families, which can be instrumental in bringing plant life a little closer to city bred students, and more than 300 kodachrome slides of plants, plant organs, and habitats are available for lending. Film strips recently pro-

duced by Life Magazine are included in our visual aids. Fired clay models of the floral envelope may be borrowed to afford students a better understanding and appreciation of a difficult concept. Other botanical models are being prepared.

In our library there are several hundred books, laboratory manuals, and journals, all of which are available on loan to the teachers requesting them. The library is claimed to be more than adequate by those teachers who have had the opportunity to use it. It contains reference books on all levels in all fields of biology, including a sufficient number of listings on secondary and elementary teaching of biology and science in general. In addition to a number of technical journals the library subscribes to a fair number of journals and bulletins which are useful to secondary school teachers.

The conference opportunities include the assistance of the department staff in identifying different forms of plant and animal life, in designing and setting up new laboratories, answering technical questions, offering information as to where material and equipment can be procured and giving aid in the teaching of different phases of biology. Faculty members of the biology department are also available as speakers to high school groups or to any other organization requesting their services. Topics covered in these addresses are usually of a general nature, but specific subjects can be arranged to accommodate the group.

The loan and consultation service has been in existence for approximately one academic year and already 32 high schools out of 122 contacted have made use of one or more phases of the service. In addition, 15 other schools have congratulated us on initiating the program and plan to make use of it "when the occasion arises." The most common request of the service to date is the discussion of the question "How can we stimulate interest in our students?" Repeatedly the teachers desired to know what they could use in new aids or living material which would create greater interest in the laboratory. The area of biology which seemed to disturb them most was botany. The reasons given for this were they, themselves, had little botany while in college or they had little interest in their college botany.

The second most popular request has been for the loan collection of preserved specimens and slides. The teachers all mentioned that they were interested in obtaining some of the less common members of the invertebrate

phyla because they found it difficult to impress the students with pictures. The prepared slides of parasites were in greater demand than any other group of slides. The chief reason for this is the high cost of these materials. Here again, the pupils were better able to learn from the actual organisms than from pictures. Some of the other inquiries concerned questions as to how students could be prepared for nature contests. Requests for science fair projects have always been refused since the material and ideas used in the contests are supposedly the work of the individual participants. The demand for speakers has been limited, the few requests coming from institutes, science clubs, and adult study clubs. The service which received the least number of calls was the library. The reason for this was due, no doubt, to the fact that library facilities are adequate in the Pittsburgh area and many schools have sufficient books for their needs.

Before going into the few problems of the service some mention should be made of two anticipated problems which did not materialize; the breakage of material and the return of material. It was expected that some of the specimens, models and other items would be damaged. We are happy to report, however, that the breakage was negligible and return of materials has been prompt.

The major problems were concerned with the loan collection. The outstanding observation on our part is that many of the teachers requested more material than they could use in a short period of time. For example, one teacher requested representatives of all the metozoans which, of course, would have kept too many specimens of our collection out of circulation. We did not have a large number of duplicates so that only a few schools could be supplied at any one time. One reason for a need of duplicates is that most of the local schools follow the same schedule of study consequently this results in requests for similar materials. Another problem is one of transportation. There is no charge for any of the services rendered and the only request we make is that the teacher desiring items must come to our laboratory. We have no mail or delivery service since this is the only way we can function on a no fee basis. Finally, in order to accommodate the visiting teachers, staff members must be willing to make themselves available for consultation in the late afternoon which is the only time the teachers can come to the laboratory.

During this experimental stage of the service we have found a genuine interest and eagerness to improve their teaching among those who consulted with us. We have come to realize more forcibly the specific nature of the problems of the secondary teacher of biology. It has proved to be, we think, a mutually beneficial experience. For them, it has provided aid in use of materials and exchange of ideas. For us, it has resulted in an understanding not only of their problems, but of students coming into college biology, and of our role in preparing teachers of the future.

Fish Mortality as a Result of Malathion Spray

JACK E. MacCURDY
South Dade High School, Homestead, Florida

The entrance and the spread of the Mediterranean Fruit Fly in Florida this year has been a serious biological problem, and both the State and the Federal government have appropriated money to eradicate the pest. An important part of the program in combatting the Mediterranean Fly is spraying infected areas by airplane. The poison used is .5 per cent Malathion in a yeast base. Infestations have been discovered in 22 Florida counties and the experts plan to spray 550,000 acres from the air and 50,000 acres from the ground.

The spraying of Malathion has been a matter of some concern to officials of the Dade County Mosquito Control District. This district includes the Greater Miami area with a large population center adjacent to salt marshes to the Southeast and the fresh water Everglades to the West. Nearly 700 miles of drainage ditches have been dug by the Mosquito Control Unit. These ditches serve two purposes: to drain off flood waters from the low lands, and to provide a home for Gambusia and other larvae-eating minnows which aid in mosquito control.

The question was whether .5 per cent Malathion would have any toxic effect upon fish—and upon Gambusia in particular. An investigation was made immediately following the

first and second aerial spraying. The following fish were observed dead and dying in small bays and inlets along the coast:

Common Mojarra *(Eucinostomus gula)*
Gray Mojarra *(Gerres cinereus)*
Silversides *(Hepsitea stipes)*
Pin fish *(Lagodon rhomboides)*
Sardine *(Sardinella macropthalmus)*
Snook *(Centropomis undecimalis)*
Mangrove Snapper *(Lutianus griseus)*
Mullet (reported dead in Miami University Lake)

Thousands of Mojarra and Silversides were found dead, compared to just a few small Snook and Snappers.

In the brackish salt marsh ditches the order of mortality was:

Sail-finned Killifish *(Mollienisia latipinna)*
Broad Killifish *(Cyprinodon variegatus)*
Carp Killifish *(Cyprinodon carpio)*
Common Killifish *(Fundulus heteroclitus)*
Striped Killifish *(Fundulus majalis)*

Thousands of Killifish were found dead. Density of dead ranged from 47 per square foot to separate individuals scattered along the banks.

The following facts were observed:

1. Dead fish were found an hour after spraying and death occurred for three days afterwards.
2. In every case the fish killed were in shallow ditches, ponds, bays, etc., where there was little wave action and little movement of water.
3. No dead Gambusia were found either in fresh or brackish water.

No conclusions were arrived at due to the fact that there was no controlled experiment. Fundulus, however, is a fish valuable in salt marsh mosquito control. Due to the large numbers of these fish found dead, it appears possible that mosquito control may be affected in the salt marshes.

Small Animal Care

"First Aid and Care of Small Animals" is the title of the Animal Welfare Institute's latest publication, a handbook for the guidance of young people and their teachers. This concise and readable 48-page illustrated booklet was written, at the suggestion of the Institute, by Ernest P. Walker, Assistant Director of the National Zoological Park in Washington, D. C.

Generation Mounts for Use In the Study of Heredity

JOSEPH C. DANIEL, JR.
Adams State College, Alamosa, Colorado

Courses in Genetics frequently include some practice in the breeding of the fruit fly *(Drosophilia melanogaster)*. When the time limitations are too restrictive or where facilities are too limited for this practice, courses may be enhanced by the use of generation

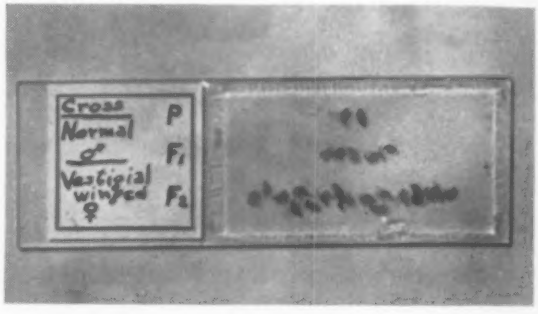


Figure 1.

mounts. Generation mounts are microscope slides, on which three generations (or more if necessary) of fruit flies are arranged so as to demonstrate a particular genetic mechanism. Reference to Figure 1 will illustrate that the three generations (i.e., the parental, the first filial, and the second filial) are represented as three tiers of flies. Two flies, a male and a female, compose the parental generation, five to eight may compose the first filial generation, and twelve to twenty flies may compose the second filial generation. The number, sex and arrangement of the normal and mutant flies may be varied considerably as long as they remain within the known limitations of the particular mechanism being demonstrated and exhibit a probable ratio.

The flies are prepared as follows:

1. Kill specimens by immersion in 70% alcohol.
2. Change of 70% alcohol—6 to 12 hours*
3. 83% alcohol—6 to 12 hours*

*Generally when the flies will no longer float, they are well saturated. Excessive immersions in the alcohols may alter the concentration of soluble pigments, and must be guarded against.

4. 95% alcohol—6 to 12 hours*
5. Absolute alcohol—3 to 6 hours*
6. Clear in wintergreen oil or xylol
7. Mount on slide and coverslip the whole.

Transference from one reagent to another is easily accomplished by retaining the flies in a Gooch crucible while en route. The crucible containing the flies may be immersed in the reagent contained in a larger, covered crucible. When removed, after the flies are well saturated, the Gooch crucible permits the fluids to flow off through the holes in the bottom. If touched lightly to blotting paper, the last traces of the liquid are removed and the flies can then be re-immersed in the next reagent.

Generation mounts are easy to prepare, give the student actual practice in the study of genetic mechanism, and make possible the coverage of many different mechanisms and mutations in a short period of time.

Building a Classroom Museum

J. L. PARKHURST, JR.
Preparator, Colonia, New Jersey

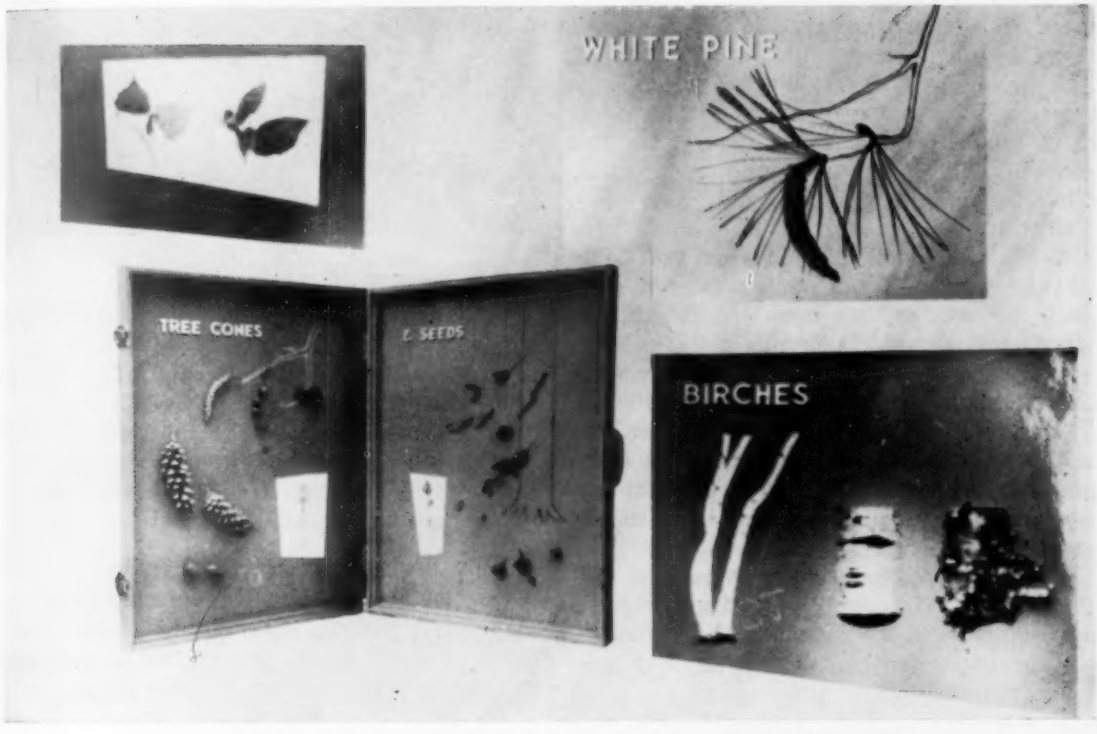


Figure 1. Open case, *Tree Cones and Seeds*, and other ideas.

Would you like to have your own classroom museum of natural history? A small cash outlay and a little work can make this idea a reality for your biology students.

In this brief outline, we are using trees for illustration. Surprisingly, trees are often overlooked entirely in museums or frequently limited to a small shelf of wood samples. Certainly an arboretum or "living tree museum" offers much more than a display to the inquiring student. But, in many areas these facilities are not available or are inconveniently located. So why not bring the great American woods to your classroom in your own panel exhibit cases?

A lumber yard will supply 4′ x 8′ sheets of Upson board, and cut out 18″ x 24″ panels. Pick a yard doing millwork in order to get a

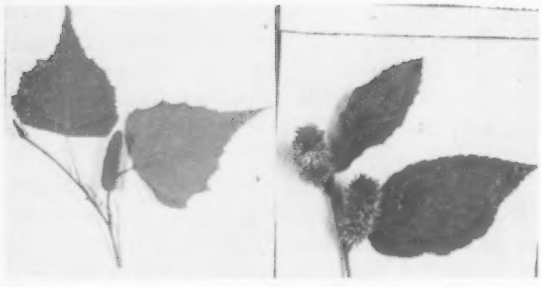


Figure 2. Mounted leaves and fruits of gray and yellow birches.

package price for the job. First, 1½" wood frames are fitted on the panels with rabbeting to protect edges. Second, two framed panels are fastened together with screws and hardware, including two hinges, two clasps and a pull. This lightweight case can be produced for approximately $6.50. *Figure 1* shows an open case.

Beginning with the exhibit of leaves, it is suggested that some photographs of fresh leaves would be useful. See *Figure 2*. After trimming an 8" x 10" dull-finish enlargement, it can be mounted quickly and easily with Weldwood contact cement. This bonds very well on an unpainted surface when you cover the print with a sheet of white paper and press firmly all over with a book. As an alternative to photographs, you might paint backgrounds characterizing the subject involved. This is also desirable for fleshy fruits.

Now the panels may be painted entirely and letters for headings mounted with Duco cement. You can purchase ¾" raised white letters made by Hallcraft at an artist's supply store.

Exhibit composition depends upon the subject and how you plan to tell the story. For some suggestions, see *Figure 3*. When mounting specimens with Weldwood you will make a secure bond by gouging into the panel with a penknife. This method is advisable for wood samples and large seeds. Do not try to mount heavy specimens.

Cutting wood samples showing bark, grain and cross-section can be taken care of on a circular power saw in the school shop. Larger cross-sections can be cut in a saw mill.

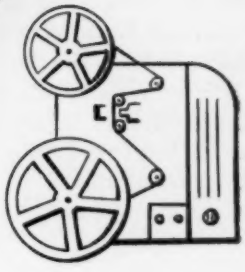
An overabundance of labels spoils an exhibit, but a certain number are required to explain it. In the school printshop you may have standardized labels made and these mounted in place with a small, headless pin.

Figure 3. Panel on *White Pine*.

Within a short time you can have cases built and buy the few necessary items. By now several ideas have probably come up and you are ready to get together photographs, sketches and specimens. Students will be interested in projects of this nature, and the finished product is useful in teaching.

Why do medicines cure an ailment in one person and occasionally fail in another? And in a given patient, why does a drug sometimes produce results in one attack and not in the next? The answer, believes Dr. Gustav J. Martin, vice-president and director of research of the National Drug Company, Philadelphia, is that neither disease organism nor host tissue is ever completely specific; that the body chemistry is constantly changing. His theory starts with the concept that there are no absolute values in biochemistry—all the elements making up the body are constantly engaged in a struggle for supremacy, and the tide of battle is forever shifting. When the shift is a wide one, a disease state results, the biochemist explained.

A-V NEWS



EMERY L. WILL
State University Teachers College, Oneonta, New York

Again this year at the December meetings of the NABT, you will have an opportunity to preview many of the newest and best film and filmstrip releases in the biological sciences. Following is a partial list of the films scheduled to be shown in New York City, early in the morning on December 27, 28 and 29:

The Bumblebee. Deusing; 11″; elementary to junior high.

Handling Laboratory Animals. Animal Welfare Institute; 20″; college.

Cicada. Moody Institute of Science; 12″; junior and senior high.

Life in the Ocean. Film Associates of California; 18″; junior and senior high.

The Human Body: Circulatory System. Coronet; 14″; high school and college.

Mitosis and Meiosis. Indiana University; 17″; high school and college.

Frogs and Toads. Young America; 11″; junior high to college.

Putting Animals in Groups. International Film Bureau; 13″; elementary.

Biography of the Unborn. Encyclopedia Brittanica; 16″; senior high to college.

Microbiology. (Filmstrip) Visual Sciences; 50 frames; high school.

The Woods of Home. (Filmstrip) Life Filmstrips; 77 frames; junior to senior high.

Descriptive material concerning the previewed films and filmstrips will be available for distribution. Won't you drop in to see what's new, and to tell us your suggestions for greater audio-visual service?

A classroom aid for visualizing water conservation and purification now is available for upper elementary and junior high classes. With the complete Water Project kit, students can practice soil and water conservation; operate a water treatment plant; build water storage reservoirs; and pump water from its source to a model community for consumption. The cost of the kit is considerable, but schools may obtain as separate units the conservation tray, water pump kit, and water treatment plant. Each unit has a well-prepared teacher's manual. Product Design Company, 2796 Middlefield Road, Redwood City, California.

Kits of visual aids for biology teaching continue to increase in size and numbers. In their newest catalogues, major biological supply companies have announced many new animal specimen sets, plant specimen sets, ecological kits, vivaria sets, genetics kits, antibiotics demonstration sets, microbiology kits, and numerous groupings of charts and colored slides. By now, even the most avid field collectors among biology teachers have been tempted by the array of kits available, as they face increasing demands on their time.

Because of widespread approval of an earlier series, Young America Films has prepared a revised and expanded set of *Science Correlations* which list films and filmstrips selected for use with each chapter of each unit in the various elementary science textbook series, grades one through six. These four-page circulars are available for science textbook series published by Allyn and Bacon, Ginn and Company, Scott Foresman, Rand McNally, Heath, Singer, Lippincott, Winston, and Scribner's. There is no charge for this

service, but be sure to mention the name of the textbook series or publisher for which you wish the *Correlations*. Young America Films, Inc., 18 East 41st St., New York 17, N. Y.

A new 500-watt projector for single and double-frame filmstrips and 2x2" slides features improved film plane temperature control, scratchproof passage for filmstrips, nonslip locking devices, and versatility in the use of filmstrips. The "Specialist" may be obtained from Bell & Howell Company, 7100 McCormick Road, Chicago 45, Illinois.

A tabletop viewer for filmstrips has been announced by Aljac Productions, Inc., 107 N. Longbeach Ave., Freeport, L. I., N. Y.

Versatility in microscopes reaches a new peak with the announcement of the AO Microstar. An extensive variety of interchangeable, standard units enables the teacher to select just those parts which are needed for specific tasks, from the simplest observations to photomicrography and other advanced work. American Optical Company, Instrument Division, Buffalo 15, N. Y.

The fifth annual Film Workshop sponsored by the U. S. Department of Agriculture is scheduled for the period, January 28–February 1, 1957. The theme this year is color—color in all of its newest roles in the visual education world. For program information, write to the Motion Picture Service, Office of Information, U. S. Department of Agriculture, Washington 25, D. C.

RECENT FILM AND FILMSTRIP RELEASES:

Animal Habitats. 12 min., sd., color. Adaptations of animal forms to the varying conditions of life demanded by desert, deciduous forest, prairie, evergreen forest, arctic tundra, and mountain timberline areas. Upper elementary and junior high. Film Associates of California, 10521 Santa Monica Blvd., Los Angeles 25, Calif.

Zoo Families. 9 min., sd., color. A visit to the zoo, to see lion, monkey, kangaroo, hippopotamus, chimpanzee, and jungle hen families. Primary. Film Associates of California.

Putting Animals in Groups. 13 min., sd., color. An introduction to biological classification of common forms of mammals, birds, reptiles, amphibians, fishes, and insects. Elementary grades. International Film Bureau, Inc., 57 E. Jackson Blvd., Chicago 4, Illinois.

The Human Body: Circulatory System. 14 min., sd., color. A fine coverage of human circulation, through extensive use of animation, cinefluorography, drawings, microscopy, and closeups of living organs. High school and college. Coronet Films, 65 E. South Water St., Chicago 1, Illinois.

Eyes: Their Structure and Care. 11 min., sd., color. Symptoms of eye trouble introduced in story form; animation of eye structure and function; common defects and their correction. Intermediate grades to junior high. Coronet.

Teeth: Their Structure and Care. 11 min., sd., color. Extensive use of animation to show tooth structure and function, and the way in which decay spreads; need for good care of teeth. Junior and senior high. Coronet.

Days of a Tree. 28 min., sd., color. A fishing trip reveals damage caused by repeated forest fires; home demonstration of effects on soil; fire prevention and control measures. Senior high to adult use. Available from State Foresters in the 14 northeastern states, and from regional office of U. S. Forest Service, 6816 Market St., Upper Darby, Pa.

From the Ridge to the River. 26 min., sd., color. The full story of local watershed organization, and the integration of land treatments toward an effective plan of soil and water conservation. Available from State Offices of the U. S. Soil Conservation Service.

From the Ground Up. 13 min., sd., color. Soil surveying, and the importance of productive soil to the populations of the world; development of a conservation farm plan. Produced in cooperation with the National Plant Food Institute. Available from the State Offices of the U. S. Soil Conservation Service.

Making a Balanced Aquarium. 8 min., sd., b&w. The step-by-step procedures of collecting materials, placing them properly in a tank, and establishing a balance. Intermediate grades. Plymouth Productions, Ltd. Coronet.

A Typical Garden Spider. 8 min., sd., b&w. A survey of the life cycle of the garden spider. Intermediate grades. Plymouth Productions, Ltd. Coronet.

A Frog's Life. 8 min., sd., b&w. Life cycle of a frog, with closeups of tadpole development, and explanations of life functions. Inter-

mediate grades. Plymouth Productions, Ltd. Coronet.

The Bumblebee. 11 min., sd., color. A complete survey of the life cycle and habits of the common bumblebee; closeup photography and good organization of sequences highlight the film. Intermediate and junior high. Murl Deusing Film Productions, 5325 West Van Beck Ave., Milwaukee 14, Wis.

Mitosis and Meiosis. 16½ min., sd., color. Comparison of these two types of cell division, through the use of stained cells, time lapse cinephotomicrography of living cells, and animation. Senior high and college. Audio-Visual Center, Division of Adult Education and Public Services, Indiana University, Bloomington, Ind.

Frogs and Toads. 12 min., sd., color. The life cycle and life processes of common frogs and toads; recognition techniques, and some calls. Junior high to college. Young America Films, Inc., 18 E. 41st St., New York 17, N. Y.

Spiders. (2nd edition). 11 min., sd., color. Characteristics of spiders; spinning the web; kinds of spiders. Intermediate grades to senior high. Encyclopedia Brittanica Films, 1150 Wilmette Ave., Wilmette, Ill.

Flowers at Work. (2nd edition). 11 min., sd., color. Flower structure and functions; details of pollination and fertilization; the composites as a group; and the cultivation of flowers. Junior and senior high. Encyclopedia Brittanica.

Biography of the Unborn. 16 min., sd., b&w. Through extensive use of animation, this film presents the development of human life within the mother's womb. While it is addressed primarily to high school and college groups in biology, nursing and home economics, it is very suitable for general adult groups. Encyclopedia Brittanica.

Gray Gull the Hunter. 18 min., sd., b&w. Exciting story of the struggle for existence among the bird life of a rocky island off the coast of Sweden; gulls, murres, scoters, plovers, mergansers and oystercatchers make up the cast. Upper elementary through high school. Encyclopedia Brittanica.

Learning About Your Nose. 9 min., sd., color. Structure and functions of the human nose; nasal hygiene. Intermediate to junior high. Encyclopedia Brittanica.

Goldfinch Family. 8 min., sd., color. Through the year with the goldfinch; behavior and family life. Elementary grades. Encyclopedia Brittanica.

Animals at Work in Nature. 10 min., sd., color. Close examination of a quiet landscape reveals intense activity on the part of its animal population; closeups show highly specialized body parts which help animals to live successfully in their environment; birds, insects, mammals. Intermediate grades. Encyclopedia Brittanica.

Big Land Animals of North America. 11 min., sd., color. Survey of the characteristics, habitat and geographical range of the mountain sheep and goats, deer, elk, moose, caribou, reindeer, buffalo and bear. Elementary grades. Encyclopedia Brittanica.

Cicada. 12 min., sd., color. The Methuselah among insects shown in the stages of its unusual life. Junior and senior high. Moody Institute of Science, 11428 Santa Monica Blvd., West Los Angeles 25, Calif.

The Bird Community. 12 min., sd., color. Meaning of biological communities comparing artificial and natural examples. Junior and senior high. Moody.

The Human Machine. 14 min., sd., color. Structure of the body; the organization of its systems, through liberal use of similes; functioning of the body as a unit. Upper elementary to senior high. Moody.

"Worms" to Wings. 12 min., sd., color. The mystery of complete metamorphosis, as seen in the swallowtail butterfly. Junior and senior high. Moody.

Fish Out of Water. 11 min., sd., color. The egg-laying and development of the grunion, and how a series of events become integrated to bring about success of the developmental processes. Upper elementary to college. Moody.

Spider Engineers. 16 min., sd., color. The engineering skill and versatility of spiders, using as examples the orb-weaver, bolas, diving, and trapdoor spiders; particularly good sequences of first and fourth examples. Upper elementary to senior high. Moody.

Animal Breeding. (Filmstrip). Color filmstrip showing the principles of breeding for protection in farm animals, using cattle, pigs and sheep as examples. Teaching notes included. Advanced high school students and college. Marian Ray, 36 Villiers Ave., Surbiton, Surrey, England.

BIOLOGY IN THE NEWS

BROTHER H. CHARLES, F.S.C.
St. Mary's College
Winona, Minnesota

RADIOACTIVITY AND THE HUMAN RACE, Dorothy, Thompson, *Ladies Home Journal*, Sept., 1956, pp. 11, 14.

This article dealing with possible effects of radiation on the genetics of humans can be used to excite discussion and further reading on the subject.

CONTAGIOUS DISEASES, L. Emmett Holt Jr., M.D., *Good Housekeeping*, Oct., 1956, pp. 34, 234.

Past and present attitudes towards some of the most common diseases of childhood.

CARBON TETRACHLORIDE, Lawrence Lader, *McCall's*, Oct., 1956, pp. 62, 79-82.

This seemingly innocent household cleaning fluid can cost you your life. Precautions when using it and satisfactory substitutes are suggested.

MAGIC WITH EYEGLASSES, Paul W. Kearney, *Sat. Eve. Post*, Sept. 29, 1956,pp. 36, 149-150.

Remarkable new lenses make it possible for many persons with poor sight to see for the first time. Specialists are needed in more cities to make these glasses available to those who need them.

HOW THE LADIES GET THEIR GLAMOR, James P. O'Donnell, *Sat. Eve. Post*. Oct. 13, 1956, pp. 30-31, 104-111.

Does your nose know? The Noses in Grasse, France are important persons in the production and preparation of flowers for enticing perfumes.

THE KILLERS, Jim Bond, *Outdoor Life*, Nov. 1956, pp. 42-43, 93-97.

Some experiences with wolves in the Yukon country. The article stresses their predatory activities.

WE MUST SHOOT MORE DEER, Robert Crichton, *Sat. Eve. Post*, Nov. 3, 1956, pp. 49, 126-129.

Deer, under man's protection from natural predators, increase faster than their food supply. Disease and death follow. This article shows the reasonableness of a more extensive kill before winter sets in.

HOW TO FIND RUFFED GROUSE, John Godfrey, *Outdoor Life*, Nov., 1956, pp. 66-71.

This article is illustrated with excellent pictures of drumming grouse by David Allen. The winter food chain of grouse comes in for a short discussion.

THE WORLD'S WORST DIET, Harry Henderson, *Collier's*, Nov. 9, 1956, pp. 6-8.

An account of a scientist who eats almost anything to determine the correct answer to other people's theories as to the effects of fasting.

WHY FAD DIETS FAIL, Elizabeth Pope, *McCall's*, Nov., 1956, pp. 33-35, 63.

Some common sense notions for those engaged in the vicious cycle of losing and gaining weight. *McCall's* Diet to Live By which parallels the article contributes some helpful suggestions for those who would diet.

Biology Projects

(Continued from page 254)

PLANT HORMONE EXPERIMENTS—Treat some seedlings with root hormone and leave some of the same group untreated. You may alter the concentrations of the hormone. Keep accurate results. Explain and chart your results. The same thing can be done with vitamin B_1, thiamin chloride, colchicine and indolebutyric acid.

References:

Turtox Service Leaflet No. 54.

Miller, Erston V., *Within the Living Plant*, Blakiston Company, Inc., New York, New York.

INSECT COLLECTION—Insects can be found almost anywhere you care to search for them. It is important that you do a careful job in collecting, labeling and preserving. A net, killing jar, envelopes, small boxes, forceps and camels hair brush are recommended but improvisations can be used. The specimens can then be mounted and labeled.

References:

Lehker, G. E. and Deay, H. O., "Insects, How to Collect, Preserve and Identify Them," Agricultural Extension Service, Purdue University, Lafayette, Indiana.

Jacques, H. E., *How to Know Insects*, William C. Brown and Co., Dubuque, Iowa.

Swain, Ralph B., *The Insect Guide*, Doubleday and Company, Garden City, New York.

NUTRITION EXPERIMENT—Use at least 6 rats, preferably of the same sex and from the same litter. Put all but two (control) on deficient

(Continued on next page)

Biology Projects

diets. Diets can be obtained that are deficient in carbohydrates, proteins, minerals, and many of the vitamins. Chart the progress of each rat and note the differences caused by their respective diets.

Care of the rats: Rats should be handled gently and without sudden movements. Fresh water must be provided every day. The dropping pan should be cleaned every day. Keep rats out of direct sunlight. Clean the cage once a week with hot water and soap.

References:
Turtox Service Leaflet No. 40.
Laboratory Experiments in Nutrition, Turtox.

REGENERATION IN PLANARIA—Planaria has remarkable powers of regeneration. Acquaint yourself with the anatomy of the animal before starting your experiment. Use Turtox Leaflet No. 16 as a basis for cutting the planaria. In addition, make some dissections of your own. Hand in a chart showing the various types of regeneration.

References:
Turtox Service Leaflet No. 16.
Hegner, Robert, *College Zoology*, MacMillan Co., Chicago, Illinois.

SKELETON PREPARATION—Prepare a large skeleton such as a chicken, rabbit, turtle, dog or a group of smaller skeletons such as mice, rats, frogs and birds. As you start your project see that as much meat is removed from the animal as is possible without breaking any bones. The specimen can be boiled and then as much meat as possible removed. Repeat this process until all of the meat is removed from the animal. The ligaments of the specimen may be left intact so as to prevent excessive wiring. Consult the reference material for details.

Reference:
Miller and Blaydes, *Methods and Materials for Teaching Biological Sciences*, McGraw-Hill Book Co., New York, New York.

SLIDE MAKING—With the aid of material that can be obtained from the teacher and reference material below, prepare a group of slides. Slides of plant stems, roots, and leaves can be made. Slides also can be made of muscle tissue, earthworm sections and numerous other material. Be sure that you are familiar with the proper fixing, embedding and staining procedures before you begin.

References:
Miller, David and Blaydes, Glenn, *Methods and Materials for Teaching Biological Sciences*, McGraw-Hill Book Company, New York, New York.
Johansen, Donald, *Plant Micro Technique*, McGraw-Hill Book Co., New York, New York.

WINTER TWIG PROJECT—A project to show how trees are as easily identified in the Winter as in the Summer. Winter twigs can be identified by the distinctive leaf scars, buds and pith. Chart can be made of this or the twigs can be mounted on a board.

References:
"Common Trees and Their Twigs," Audubon Nature Bulletin, Series No. 14, Bulletin No. 5, Jan. 1950 National Audubon Society, 1000 Fifth Avenue, New York 28, New York.
"Winter Twigs," The Bulletin of Popular Information, Morton Arboretum, Lisle, Illinois, Vol. k8, 1943, No. 11.

POLLUTIONS OF WATER PROJECT—Samples of water may be taken from various sources for testing organisms present. Samples taken before and after it leaves the sewage plant would be good examples. Test your own drinking water. Go into the country and test water from different wells. There are tremendous numbers of possibilities for this project.

After your samples are collected you can test them using the Coliform Test described in the manuals below.

References:
"Standard Methods for the Examination of Water and Sewage," American Public Health Assn., 1790 Broadway, New York, N. Y.
"Difco Manual," Difco Laboratories, Detroit 1, Michigan.

SOIL TESTING—With the aid of the soil testing kit test a large number of lawns and analyze them for their deficiencies. Give a demonstration on the procedure and recommend the needed nutrient. This would be an excellent color photography project, also, as you could show the before and after.

References:
Soil and Plant Tissue Tests, Station Bulletin 635, March 1956, Purdue University Agricultural Experiment Station, Lafayette, Indiana.
Hunger Signs in Crops, The American Society of Agronomy, Madison, Wisconsin.

TEMPERATURE VARIATION IN THE HUMAN—Chart the fluctuations of body temperature during the day of yourself, your family and some of your friends. Temperature should be taken every hour while the person is awake. Does the temperature vary? Do some people have higher temperatures in the morning, afternoon, evening?

References:
Best & Taylor, *The Living Body*, Henry Holt and Company, New York, New York.

(Continued on next page)

Carlson, A. and Johnson, V., *The Machinery of the Body*, University of Chicago Press, Chicago, Illinois.

A TERRARIUM—You should first determine the type of terrarium that you would like to work with. You can select a Woodland Habitat, Desert Habitat, Bog Habitat, or Swamp Habitat. Next you should select the type of plant life that you want and is suitable for your terrarium. Next you should select an animal or group of animals that will be suitable for the habitat you have selected. Keep close watch on your project and make a report to the class.

References:

Miller, D., and Blaydes, G., *Methods and Materials for Teaching Biological Sciences*, McGraw-Hill Book Company, New York, N. Y.

Turtox Service Leaflet No. 10.

TROPISMS—In this project you can show how a plant reacts to its environment. You can show how a plant grows toward light. Turn a small potted plant on its side and observe how the stems and roots react. There are many other possibilities for you to investigate and report to the class.

Reference:

Miller, Erston V., *Within the Living Plant*, Blakiston Company, Inc., New York, New York.

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HEALTH AND SAFETY (Campers)
SAFETY IN AN ATOMIC ATTACK
SCHOOL BUS SAFETY
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